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SUGAR PRICES FOR MONTH ENDING MARCH 13, 1909.

1909		Centrifugals.	Beets.	Parity.
Feb.	11	3.61¢	10s	4.11¢
"	12	3.61¢	10s	4.11¢
"	13	3.61¢	10s	4.11¢
"	15	3.61¢	10s	4.11¢
"	16	3.61¢	10s	4.11¢
"	17	3.61¢	10s	4.11¢
"	18	3.61¢	10s	4.11¢
"	19	3.61¢	10s 0¾d	4.12¢
"	20	3.61¢	10s	4.11¢
"	22	3.61¢	10s	4.11¢
"	23	3.69¢	10s 0¾d	4.12¢
"	24	3.7325¢	10s 2¼d	4.15¢
"	25	3.73¢	10s 2¼d	4.15¢
"	26	3.73¢	10s 1½d	4.14¢
"	27	3.73¢	10s 1½d	4.14¢
March	1	3.73¢	10s 1½d	4.14¢
"	2	3.705¢	10s 1½d	4.14¢
"	3	3.73¢	10s 1½d	4.14¢
"	4	3.80¢	10s 3d	4.16¢
"	5	3.803¢	10s 3d	4.16¢
"	6	3.803¢	10s 3d	4.16¢
"	8	3.803¢	10s 3d	4.16¢
"	9	3.803¢	10s 3d	4.16¢
"	10	3.80¢	10s 4½d	4.19¢
"	11	3.80¢	10s 3¾d	4.18¢
"	12	3.81¢	10s 3¾d	4.18¢
"	13	3.81¢	10s 3¾d	4.18¢

Willett & Gray in their Weekly Statistical of March 4, say:

RAWS.—The market during the week under review has been generally firm in tone and tendency whenever actual purchases

could be made to a considerable extent, but during intervals of quiet an easier tone was at times noted, leading to a very small business, in instances, at a slight concession, but finally closing under transactions covering 200,000 bags Centrifugals at full up quotations of last week, basis 2⅜c. c. & f. for March shipment of Cuba sugars, and at its equivalent of 3.735c. per lb. landed, for 96° test Porto Rico sugars. Speculators are reported to have paid 2 7-16c. (3.80c.) for first-half April and 2 15-32c. (3.83c.) for second-half April shipment from Cuba.

The fact that such a large business has been done in March shipment at 2⅜c. c. & f., 96° test, is evidence of a settled conviction of the refiners that, with whatever outcome of crop, the price is a good one for the accumulation of supplies, hence all sugar in sight is taken by buyers without hesitation. Few supplies for April shipment have thus far been secured, and a higher value than for March is assured from present outlook.

Porto Rico has been quietly following the market with sales at full up values, when buyers were in the market, and making no pressure to sell when buyers are absent. In this way, Porto Rico gets their share of sales making, and receipts here are now increasing considerably.

As usual at this time of the year sugars from San Domingo are arriving at New York and being forwarded to United Kingdom and Canada, where they are finding buyers at prices about ⅛c. per pound above the parity of values here.

Europe continues to take a pessimistic view of the Cuba crop, and places but little value on estimates coming from Cuba and the United States, "because the atmospheric influences will have an important bearing upon the final result," which conclusion is correct, but all the same it is well to keep track of current crop conditions in relation to final outcome. If, in future, conditions should be changed, then crop estimates will be changed to conform. This is the most that can be done by any crop experts in any country, at any time.

The 2,000 tons decrease for the week in receipts at Cuba six ports is probably due to limited railroad facilities and has no special significance. An occasional correspondent cables us today from Havana: "Weather favorable for harvesting."

The receipts at the Four Ports United States in February were 268,350 tons, the largest February receipts ever recorded. The largest of any month on record was in May, 1907, when 326,996 tons came in.

Mr. C. Czarnikow (London) estimates that Java will have to find a Western outlet for 400,000 tons or more. America took 429,770 tons Javas from last crop, but from present outlook will have no place for any quantity near 400,000 tons, unless consumption very largely increases. It is always possible that the new sugar duties, if reduced, may bring Javas into competition with Cubas, owing to the evident low cost of production in Java.

Java sugars are not mentioned here at present, and will not be until something definite is known about our new tariff sugar schedule; all that is known at present is that a limited amount of the Philippine crop (300,000 tons per year) will be admitted here free of duty. A special session of Congress convenes March 15th, when the new Tariff bill will be presented to the House of Representatives by the Committee on Ways and Means. Prompt action by the House is expected, but more or less delay in the Senate.

EUROPEAN BEET CROPS.—Following is Mr. F. O. Licht's latest estimate (February 19, 1909), in detail, of the European beet sugar production 1908-09, compared with actual outturn of the last five campaigns:

		1908-09	1907-08	1906-07	1905-06	1904-05	1903-04
Germany	Tons	2,060,000	2,129,597	2,239 179	2.418,156	1,598,164	1,927,681
Austria	"	1,400,000	1,424,657	1,343,940	1,509.789	889,373	1,167,959
France	"	800,000	727,712	756,094	1,089,684	622 422	804,308
Belgium	"	255,000	232,352	282,804	328,770	176,466	209 811
Holland	"	212,000	175,184	181,417	207,189	136,551	123,551
Russia	"	1,275,000	1.410 000	1,440,130	968,500	953,626	1,206,907
Other countries	"	500,000	462,772	467,244	410,255	332,098	441,116
TOTAL TONS		6,502,000	6,562,274	6,710,808	6,932 343	4,708.758	5,881,333

AMERICAN BEET CROP ESTIMATE.—The American beet sugar factories have finished their campaign, and we have obtained from the best sources reports of the results for the season 1908-09, which may be stated as follows, compared with the 1907-08 campaign:

STATES	1908-09 Factories Operating	1908-09 Sowing Acres	1908-09 Beets Received, Tons 2,240 lbs.	1908-09 Sugar Produced, Tons 2,240 lbs.	1907-08 Factories Operated	1907-08 Sowing Acres	1907-08 Beets Received, Tons 2,240 lbs.	1907-08 Sugar Produced, Tons 2,240 lbs.
Wisconsin	4	18,000	125,000	16,964	4	14,500	110,714	13,571
Michigan	16	96,000	565,572	79,597	16	100,300	620,099	76 078
Colorado	15	139,626	943,400	103,159	16	136,339	1,480,726	183,345
Utah	5	31,498	356,467	40,828	5	30,054	306,541	39,720
Idaho	4	22,930	180,181	23,353	4	28,632	200,271	27,715
California	9	76,960	578,506	88,347	8	55,129	426,808	6?847
Nebraska, New York, Illinois, Ohio, Minnesota, Iowa, Montana, Kansas, Arizona, Oregon, Wash'gton	* 10	45,135	262,242	31,762	10	46,816	297,861	35,924
TOTAL	63	430,149	3,011,368	384,010	63	411.800	3.443,020	440,200

† Eleven States, each having only a single factory, except Nebraska having two, of which one is closed. In these eleven States ten factories were operated this season, the Arizona factory remaining closed, but is expected to operate next season.

The decrease in production compared with last year is 56,190 tons sugar or 12.76 per cent., due to the irregular weather pre-

vailing throughout the growing period, the gain by favorable conditions in California and Michigan being much more than offset by the great damage done by the long drought in Colorado, as reported by us from time to time.

The average yield of sugar per acre sown this season was 0.89 ton, against 1.07 tons in 1907-08, and 1.08 tons in 1906-07, and 0.83 ton in 1905-06.

There was an increase of 4.46 per cent. of sowings compared with last year, but 30 to 50 per cent. of the acreage in Colorado and Kansas was lost and could not be recovered by replanting.

The total number of factories working this season was 63, the same as in the last two seasons.

One new factory was established this season at Corcoran, California, and another new factory is building in California, at Santa Ana, to begin operations during the coming season.

The production of beet sugar in the United States in campaign 1906-07 was 433,010 tons; in 1905-06 was 283,717 tons; in 1904-05 was 209,722 tons, and in 1903-04 was 208,135 tons, of 2,240 pounds each.

NOTES.

HAWAIIAN TRADE STATISTICS FOR 1908.—During the twelve months ending December, 1908, the Territory of Hawaii exported to the United States mainland, merchandise of the value of $41,627,448 all of which was carried in American vessels. Of this amount $37,570,636 was raw sugar and $1,940,678 was refined sugar. Delaware Breakwater received merchandise, almost exclusively sugar, of the value of $20,225,677, New York $330,047, Philadelphia $344,252 and San Francisco $20,712,773. The shipments of fruit, fresh and canned, amounted in value to $923,611.

The shipments of domestic merchandise from the mainland of the United States to this Territory for the same period were valued at $15,217,243. This shows an increase over the 1907 imports of nearly one million dollars.

It is interesting to note the growth of the trade between the United States and Porto Rico. During 1908 Porto Rico imported from the United States merchandise of the value of $22,184,066 and exported to the United States merchandise valued at $24,286,181, of which amount sugar constituted $16,896,804.

LABOR DIFFICULTIES IN QUEENSLAND.—In the annual report of the Bureau of Sugar Experiment Stations of Queensland for 1907, Director Walter Maxwell is quoted as follows: "High experimentation, and the best modern methods that are practiced in other cane-growing countries, are gradually becoming impossible

in Queensland, due to want of labor power, at a paying cost to carry such methods into practice."

It would seem that the Australian Government acted too hastily in driving out the Kanakas and endeavored to inaugurate a "white man's Australia" somewhat prematurely. Judging from the foregoing statements and from the remarks of workingmen, who have passed through here on the way to the Mainland, that "Australia is no place for a white man," the Government seems to have pleased neither the capitalist nor the laborer. Possibly if the change had been worked out gradually, better results would have been accomplished.

AMERICA'S AMAZING AGRICULTURAL ADVANCE.—Statistics of agricultural wealth production, value of farm property, and of population engaged in agriculture during the years 1870 to 1908, inclusive, are presented and discussed in the Manufacturers' Record.

The increase in value of farm products is shown by the statement that "in the 20-year period between 1870 and 1890 the gain was only $500,000,000; in the 30-year period between 1870 and 1900 the gain was only $2,800,000,000; whereas in the 8-year period from 1900 to 1908 the gain was $3,300,000,000, or $500,000,000 more than for the 30 years from 1870 to 1900." In 1907 the value of farm products raised was $7,412,000,000, the value of all farm property $28,077,000,000, and the number of people engaged in or dependent on agriculture 11,991,000. The great increase in wealth production is attributed to the rapid growth in scientific farming.

PHILIPPINE TRADE STATISTICS.—Statistics relating to the shipping trade of the Philippines show that very little progress was made in that traffic last year. There was some increase to the credit of the British and German flags, but the Japanese flag was the greatest gainer, with 41 vessels and 127,000 registered tons, while in former years it was scarcely represented at all. The American trade with the islands has fallen off considerably, last year's movements under that flag only totaling up to 94,000 registered tons. The value of cargoes, outward and inward, in British vessels was $40,000,000; in Spanish vessels, $8,900,000; in German vessels, $6,300,000; in American vessels, $3,200,000.

THE IMMIGRATION BILL.

The Governor has signed the bill passed by the Legislature increasing the income tax for the purpose of providing funds for immigration and the conservation and development of the natural resources of the Territory. The Act provides that in addition to the tax of two per cent. already authorized to be levied, there shall be levied and collected upon incomes over and above four thousand dollars a tax of two per cent. All amounts collected under this law shall be held as a special fund and applied as follows: Three-fourths for the encouragement of immigration to the Territory of Hawaii by the Board of Immigration, and one-fourth for the development, conservation and improvement of the natural resources of the Territory.

It is estimated that, with average sugar prices, the amount which will be derived from this tax will be approximately three hundred thousand dollars per annum.

This measure was planned and fostered by the Governor with the sanction and approval of the sugar interests of the Territory, who will, of course, be the largest contributors, but even with this backing the bill was all but defeated.

The situation which makes necessary such legislation was clearly stated by one of the prominent sugar men at a public hearing of the proposed measure, as follows:

"It is necessary for the maintenance of the one great industry o fthis country, and for the development of any other industry, that laborers be provided through immigration.

"The only immigration to Hawaii since the annexation of these Islands to the United States, with the exception of some Portuguese and Spanish, brought in by the Territorial Board of Immigration, has been of Japanese. For many years the laboring force of the plantations has been, to a very great extent, made up of Asiatics.

"As we all know the majority of the Asiatics who have come here have not intended to make this their permanent home, and the consequence has been that, although, there has been a large immigration of such people, there are comparatively few of them who could be classed as a resident population. The average Japanese who has come to Hawaii has seldom worked on the plantations longer than five years, after which time, he usually returns to his home country with his accumulated earnings, or if he remains, enters into other lines of employment.

"About two years ago through Congressional action and Executive regulation, in conjunction with the Japanese government, the immigration of Japanese was curtailed, and the lines have been drawn closer all the time, until now the Japanese government has adopted a policy of almost complete exclusion of its people from the United States.

"At the present time there is a sufficient supply of labor for the needs of the plantations, but the Asiatic laboring class, being more or less transient, their number is steadily decreasing by departures for Japan, and it is easy to see that a long continuance of such conditions must bring trouble to the plantations, and financial distress for the Territory and its inhabitants.

"From the time that the Federal Government became actively interested in our industrial problems, there has been a great and persistent pressure from that source upon the Territorial Government and upon the sugar plantations to increase through European immigration the non-Asiatic population of the Territory. Every government official who has been here and investigated our conditions, has repeatedly urged this upon us. They have openly stated that Asiatic immigration would be cut off and that our only source of labor supply would be from the mainland and Europe.

"The past efforts of the Board of Immigration have been conducted with the distinct approval and sanction of the Federal administration, which from the President down to its labor and immigration officials, has manifested the greatest interest, and extended hearty coöperation, in this work.

"You may accept it as an established fact, that Asiatic immigration to Hawaii is a thing of the past and that any effort to seek such immigration will find no support, but a great deal of opposition on the part of the Federal government. The administration at Washington is absolutely determined that the population of this Territory shall be built up of other than Asiatics, and every step will be taken to accomplish this end. The Federal Government desires that we work out our own salvation along the lines indicated, but if we do not reach the desired result voluntarily, measures will be taken to accomplish this for us, even though such measures lead to a curtailment or perhaps, sacrifice of our principal industry.

"In 1905, the Legislature of Hawaii created a Board of Immigration and in 1906 and 1907 the Board introduced about 2400 Portuguese from the Azores and Madeira Islands and about 2200 Spaniards from Malaga, at a cost of approximately $300,000. This sum was contributed entirely by plantation corporations free of conditions except that it should be used for the purpose of European immigration. Naturally a great majority of these people sought work on the plantations, and we have every reason to believe that this money was well expended and a great benefit has been derived from this immigration.

"Immigration of this character, however, was cut off by the amendments to the Immigration Law in 1907, which amendments prohibit contributions to the Board of Immigration by corporations. A bill was introduced in Congress to amend the Immigration Laws so as to permit the resumption of immigration to Hawaii upon the same lines as conducted by the Board of Immi-

gration, but, although every effort was made to secure its passage, this measure was overwhelmingly defeated.

"The only method by which European immigration can be conducted is by the Board of Immigration of the Territory, with funds raised by legislative enactment, and regularly appropriated for that purpose.

"It seems to be an established conclusion that at the present rate of taxation, the income of the Territory will be insufficient to provide any funds for the purpose of immigration.

"The amount that should be expended annually for the furtherance of immigration should not be less than $250,000 to $300,000. With this amount the Board of Immigration should be able to obtain three shipments of European immigrants per annum, basing my conclusion on what the Board has heretofore accomplished.

"The question which presents itself is by what method shall this fund be raised. The burden of taxation should be placed on those who are best able to bear it and upon those who will naturally derive the most immediate benefit from the immigration. In no way can you reach this result better, than by increasing the income tax along the lines proposed by the Governor.

"The additional amount obtained by an increase of the income tax of two per cent. on incomes above four thousand dollars will be secured principally from the plantation companies, and I consider that the burden of the increase will be more equitably distributed, and be borne by those who are more able to bear it, in this manner than by any other method that has been proposed and has come to my attention.

"Furthermore, so far as I am informed, the plantation interests stand ready to support this measure and have no opposition to offer to the proposed increase of income taxation, provided, that the revenue derived therefrom is used for the purpose under consideration. The plantations realize the necessity of immigration and also that they will derive direct benefit from the bringing in of a number of European immigrants, and realizing this, they are willing to stand the greater proportion of the expense thereof."

SEEDLING CANES IN OTHER COUNTRIES.

Much success has attended the efforts of the Queensland Acclimatization Society to raise sugar cane from seed. During the last season about 450 seedlings were reported as the result of the season's work. The first experiments in this line were attempted in 1903 and with such success that the work has been continued. All seedlings are carefully analyzed and by a process of elimination those showing no special promise are thrown out. Cuttings of those retained are distributed by the society, and at

the date of the report very little had been heard concerning the seedlings. One cane, Q. 116, seems to be showing more promise than any of the others. No experiments with artificial cross fertilization with the flowers have yet been attempted in Queensland.

In Barbados under the direction of the Imperial Department of Agriculture seedling experiments have been regularly carried on for a number of years and in addition to the smaller plots on which the seedling canes are first tested, the plan has been adopted, with the coöperation of estate owners, of growing some of the more promising varieties, on areas of from one-half acre upwards, under ordinary estate conditions. In this way a number of different varieties can be raised in the same field, and the plots are large enough for the canes produced to be separately crushed at the estate mill, the juice being measured and analysed. Data is thus available for ascertaining the sugar yield and other qualities of a given cane, when grown under practical conditions.

In the year 1907-8, opportunities have been afforded on a number of estates, of comparing the yields of some of the best known seedling varieties with the White Transparent on areas varying in extent from one-half acre to seven acres.

The returns given by B. 208 and B. 376 are especially satisfactory, and account for the increasing popularity of these seedlings at Barbados.

In that portion of the report on these experiments dealing with the production of new seedlings, it is mentioned that of the 219 seedling canes planted for the first time in 1906, twenty-two passed the standard as regards their field characters and the richness and purity of the juice. They were replanted in 1907, and will also be again grown and tested in the present season.

At the end of 1907, no less than 6,690 new seedlings were obtained, of which twelve were the result of artificial hybridization. About two-thirds of the above seedlings were transplanted in the field, and will be tested in the reaping season of 1909.

In 1902, fourteen seedlings were obtained from B. 208 and D. 95, planted in chess-board fashion. On the crop returns of the past two seasons from the small experiment plots, the yields given by five of these (B. 8,660, B. 8,600, B. 8,651, B. 8,520, and B. 8,609, in the order mentioned) have exceeded the return from White Transparent.

A series of variety experiments carried on in Demerara indicate that many varieties can be relied upon to give yields of sugar in quantities equal to or greater than those obtained from the Bourbon (Lahaina) cane, and that several varieties possess well-marked ratooning qualities. J. B. Harrison, Director of Agriculture, states that certain varieties—D. 95, D. 74, D. 78, and the White Transparent—show signs of falling off in their yields, and the

committee feel that their cultivation should not be continued except on lands which have proved very suitable to their growth. D. 109 showed on several plantations signs of falling off in its yields, especially where grown as 2nd and 3rd ratoons, although on others it gave very satisfactory results as plant canes. The falling off in the yields of certain of the newer varieties noticed in this colony is similar to experience reported from Java with other varieties of sugar canes which have been raised from seed. The committee recognize that it is a very important factor and one which demands close attention.

Cultivation of new varieties of sugar canes has become so extended that the statement in earlier reports that "in the cases of many of the experiments the varieties of sugar cane have been grown on land on which the Bourbon cane does not flourish" is no longer a general one.

SOIL ACIDITY.[1]

By W. P. KELLEY, Chemist, Hawaii Experiment Station.

In recent years the soil has been the subject of a vast amount of investigation and discussion. Some investigators have directed their efforts solely toward a study of the emperical composition of soils; others have investigated a single class of bodies; and still others have considered the practical side, looking only to the maintainance of crop yields without effort to determine any of the fundamental reasons connected therewith.

For a time following the announcement of the mineral theory of the plant growth by Liebig, great stress was laid on the chemical analysis of the soil, it being generally believed at that time that crop yields and the maintainance of the soil were largely, if not entirely, dependent upon its mineral constituents. Following this period, agricultural chemists began to realize that the chemical analysis of a soil, without other experimental data, often proved of but little value in determining its needs. About the middle of the nineteenth century this opinion became so general that in various European countries, experimental farms were established where both field experiments and laboratory analyses were brought to bear on this important subject. In connection with both laboratory and field investigations, various question have been studied; some of purely practical, others of technical interest.

Among the subjects of special interest in this connection is that of soil acidity. It has been recognized for a considerable time

[1] Read before the Hawaiian Chemists' Association, January 9, 1909.

that cultivated soils tend to become acid, and while the recognition of this acidity has been more or less general, in recent years it has formed the subject of a vast amount of investigation. Before entering upon a discussion of the various methods employed in the determination of soil acidity, it seems advisable to consider the question of what it is that constitutes soil acidity.

The substances comprising soil acidity may be divided into three classes, namely, organic, including such complex bodies as are usually designated under the name of humic and ulmic acids, etc.; inorganic, such as sulphuric and hydrochloric acids; and acid salts, such as hydrated silicates, and certain other acid salts. It has been repeatedly observed that soils containing large amounts of organic matter often give an acid reaction with certain chemical reagents. Such acidity is generally attributed to complex organic acids which arise in the decomposition of vegetable matter in the soil. Inorganic acidity has not been positively identified to a very great extent, though it is believed to follow the heavy application of certain fertilizing substances. The heavy application of ammonium sulphate, through a series of years at the Woburn Experiment Station, on land containing a relatively small amount of lime, for instance, resulted in such sterile condition of the soil that successful cultivation was impossible until the land received a heavy application of lime. Such sterility is not believed by some chemists to be due so much to the development of mineral acids, as to the gradual accumulation of acid salts in the soil. In this connection, it may be said, however, that whether the continued application of ammonium sulphate results in the accumulation of actual acidity, or a depletion of the active lime in the soil, it has long been known that a condition unfavorable for the growth of most cultivated crops usually follows such an application; and furthermore, the subsequent addition of considerable calcium carbonate entirely overcomes such a condition. At the Rothamsted Station, for instance, on land previously treated with some ten to twelve tons of Marl per acre, the annual application of ammonium sulphate for the past fifty years has not produced such effects as above referred to on fields of the Royal Agricultural Society. That hydrated silicates and acid salts in general are developed to an appreciable extent in long cultivated soils, is amply attested by some recent investigations of F. P. Veitch of the Bureau of Chemistry, Department of Agriculture; and by Doctor C. G. Hopkins and his associates, at the University of Illinois.

Furthermore, it seems expedient at this point to inquire into the manifestation of sourness in the soil. There has been considerable effort on the part of some soil chemists to correlate soils by means of the vegetation and natural forests which they support. For instance, Doctor Hilgard, in his book on soils, pointed out the significance of native forests as indicating the character of the land; and it is a matter of common knowledge in various parts of the mainland, and in European countries, that the appear-

ance of certain weeds indicates an acid condition of the soil. It has been definitely shown, by various investigators, that all plants are not equally affected by acidity; and these observations show that in many instances there is no manifestation of injury to certain crops on acid soils, where others utterly fail to grow. For mainland crops, one of the most reliable indications of sourness in the soil is that of legume crop failure; and though this indication has sometimes proven erroneous, in general it is quite reliable.

Various methods have been devised for the determination of soil acidity. One of the first to be used was the litmus test, which has been employed more or less generally in all parts of the world. There has arisen in the minds of some investigators, however, considerable doubt as to its reliability. The work of Doctor Wheeler and his associates, at the Rhode Island Experiment Station, indicates its uncertainty, although these investigators maintain that this method possesses distinct value in the hand of a skilled operator. When it is remembered that blue litmus is affected by carbonic acid, and that this body occurs in considerable quantities in almost all soil waters, it is at once evident that the test may point to unwarranted indications. In the investigations by Wheeler and his associates, all of the leading methods previously employed for the determination of soil acidity were brought into comparison, and a very trustworthy check made possible by the extensive field experiments of that Station on soils which are known to be decidedly acid. At the conclusion of these investigations, none of the hitherto employed methods proved to be thoroughly satisfactory for the determination of the lime requirements of such soils, as are found in Rhode Island.

Later, Doctor Hopkinds presented a method for this determination which consists in the digestion of the soil with a weak salt solution, and the determination of the acidity of the extract by means of a standard alkali. Immediately following the announcement of this method, Veitch published a method which was devised in the Bureau of Chemistry, and which consists in digesting ten grammes of soil with varying amounts of lime water, and determining by trial the quantity that is sufficient to neutralize any acids present. This method has proven a very valuable one in many instances, and especially recommends itself as a reliable quantitative method for the determination of acidity, since it involves the use of lime water, essentially the material which is almost universally used in practice to neutralize acidity in the soil.

In the course of some investigations at the Indiana Experiment Station, the writer had occasion to investigate some of the methods referred to above, with soils of known history and upon which the station had been experimenting for a number of years. The principal soils of that State may be roughly classified into three types—clays, loams and peaty soils. On each of these types extensive field experiments have been conducted for a series of years, and the action of lime fairly well understood on each.

There is but little lime-stone soil in the State, yet it has been repeatedly demonstrated that lime is of no value to certain of these soils. For instance, the peaty soils of that State have been the subject of experimentation for twenty years or more, and almost without exception lime has proven valueless when applied to this type either singly or in combination with other fertilizing substances. The litmus test on this type indicates that in many instances the soil is decidedly acid; and this indication is in harmony with the reports on peaty soils from other sections of the mainland and Europe, where such soils have long been reported to be very sour.

The clay soils of Indiana contain very small amounts of lime, and, in turn are almost universally benefited by the application of this substance. Yet many of these soils react with litmus very much more faintly than the peaty soils. In this connection many samples of soil from every section of the State were examined and with all types alike the indications from the litmus test were found to bear but little relation to the results of the application of lime. It may be mentioned, however, that no claim has been made for the use of litmus in the quantitative determination of soil acidity; but, on the other hand, no one method has been so generally used for the detection of soil acidity, and in many instances great reliance is placed on it.

The official method for the determination of the more active forms of phosphoric acid, etc., in soils involves the preliminary determination of the amount of acid neutralized by a given quantity of the soil upon digestion at 40 degrees for five hours. This determination is necessary in order that a fifth normal acid solution may be maintained in the digestion of the soil for phosphate determination, etc. In the course of this determination on soils from various parts of Indiana, it was noticed that those soils which responded most to the application of lime neutralized the least amount of acid; and, without exception, the peaty soils neutralized many times as much acid as the clay soils; and, as an outcome of a large series of determinations, it was shown that a correlation of these soils, with reference to their lime needs, may be easily made by use of these neutralization numbers. Those soils, which neutralized less than one c. c. of fifth normal acid per gram of soil in this digestion, are almost universally benefited by the application of lime, whereas those that require more than one c. c. of fifth normal acid per gallon, are little benefited by its application.

Let us inquire into the cause of these reactions. Why is it that soils which are made up almost altogether of decayed organic matter, containing over 90% of combustible material, and which have been submerged for centuries, are so little benefited by the application of lime, and yet react so strongly acid toward litmus? In many instances the water rises on these soils to within eighteen inches of the surface; and unquestionably a condition favorable to

the development of organic acids prevails here throughout a large part of the year. Analyses of the soil, however, show that it contains about 3½% of lime and the soil water is almost saturated with calcium carbonate held in solution largely by carbonic acid.

Therefore, it seems likely that this soil does not respond to the application of lime because it already contains a large amount of this material, and that the reddening of litmus is brought about by some condition in this soil which is not permanently changed by the application of lime; and which is not deleterious to successful crop production. It has been claimed by Wahnschaffe and others that since carbonic acid, which exists to a more or less extent in all soils, reddens blue litmus paper, it is necessary to dry the paper before the observation is completed. In Watt's Dictionary of Chemistry it is stated that a solution of carbonic acid turns blue litmus red, but the blue color returns upon exposure to air. Wheeler and his associates have demonstrated that blue litmus, after having been reddened by carbonic acid, does not regain its blue color upon drying. In the decomposition of the organic matter in these soils large amounts of carbon dioxide are evolved, which necessarily produces a more or less saturated solution in the soil moisture, this being thus heavily charged with carbonic acid, dissolves considerable quantities of calcium from the decaying vegetation. Carbonic acid, in this soil moisture, however, has the power to turn blue litmus red. At least whether it is carbonic acid in these peaty soils, or complex organic acids which redden litmus, experiments by the writer show conclusively that no shade of blue color is returned to litmus paper after having been acted upon by these soils.

In the instance of the clay soils there is a decidedly different condition. Here, on the one hand, the organic matter of the soils amounts to less than 5%, and is usually present to the extent of about 2% only. On the other hand, this type contains not over 2-10 to 3-10 per cent. of lime. Some of these soils are decidedly acid to litmus; others weakly acid; while still others are neutral; yet on practically all of these leguminous crops are greatly benefited by the application of lime; while in many instances, other crops do not seem to be affected. A similar condition is met with in Illinois, where the Experiment Station is recommending the application of large amounts of ground lime-stone as a means of securing better leguminous crops. On one of the experimental fields in southern Indiana, the application of lime has not materially affected the yield of corn and wheat, but the vigor and yield of clover and other legumes are very much greater where lime has been applied. There is a certain acidity in this soil, as chemical tests have demonstrated, yet this acidity, in some instances, does not seem to affect the growth of corn and wheat.

Some investigators have largely attributed the beneficial effects of the application of lime to the fact that it affords a more suitable media in which bacterial life can flourish; and it is certain that the

class of organisms which infest the roots of leguminous plants, and which are so necessary for the thrift and luxuriant growth of these plants, cannot develop and exert their greatest influence in an acid soil. The application of lime to these soils, therefore, brings about a better condition for the development of nitrogen-gathering bacteria, and hence, the great benefit of the application of lime to this class of soils may in part be explained in this way. Furthermore, nitrification cannot take place to the greatest extent unless there is a certain amount of carbonate of lime present, since in this process nitric acid is formed and this acid inhibits bacterial activity unless there is a sufficient base with which it can unite.

Wherever there occurs any considerable quantity of lime in the soil the amount of acid which it would neutralize in the preliminary digestion, is proportionately great; and since lime, in addition to forming an element of plant food, is very necessary in order that bacterial life may flourish in the soil; and since a larger percentage of the active lime in cultivated soils exists in the form of the carbonate, it would seem that the neutralization factor would point to reliable indications, especially on soils of known type and origin. It is not claimed that this titration method could be relied upon for the determination of the lime requirements of soils containing large amounts of other carbonates.

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*HAWAII, ITS NATURAL RESOURCES AND OPPORTUNITIES FOR HOME MAKING.**

Under the above title Mr. Newell, Director of the United States Reclamation Service, reports the results of his investigation of Hawaii, and its possibilities from the standpoint of the Service of which he is the head.

The report is all very interesting and deals with the problems of the local government and agricultural interests in a liberal and impartial manner.

In the introduction he speaks of the natural advantages of these Islands and the opportunities offered by a rich soil, a highly developed civilization and most notably, by a climate ideal as regards comfort and suitability for high physical development. The duties of the Nation to the Territory from a political, medical and military standpoint are also mentioned.

The land surface of the eight inhabited islands is stated at 6,500 square miles—a little over 4,000,000 acres—being a little less than the area of the State of New Jersey.

Climate and soil characteristics are considered and a diagram

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* By F. H. Newell, Director of the Reclamation Service; Senate document No. 668.

showing the relative extent of arable, grazing, forest, reclaimable and waste lands is displayed, the proportions being: Arable six per cent., reclaimable four per cent., grazing thirty-three per cent., forest twenty-five per cent., waste thirty-two per cent. The total area of the public lands of the Territory is estimated at a little over 1,600,000 acres, much of which has little or no value; about 34,000 acres is in sugar cane and 500,000 included in various ranches, 273,912 acres are in forest reserves and 300,000 additional will be set aside for this purpose. The rectangular form of subdivision adopted throughout the greater part of the United States is unknown and inapplicable to the physical and cultural conditions existing in the Islands.

Referring to the water supply Mr. Newell says there is probably no part of the United States where in as small an area there is as great a diversity in the quantity of water and its availability. Even with the heavy rainfall on the mountain slopes there are relatively few rivers and living streams.

"IRRIGATION DEVELOPMENT.

"There are now under irrigation, mainly in sugar cane, about 110,000 acres. The investment in ditches, tunnels, reservoirs, pumps, etc., amounts to over $15,000,000, or at a rate of about $140 per acre. The older ditches—some in rock tunnel—were begun by the natives in prehistoric times. The latter larger works have been built mainly by the sugar planters.

"Irrigation development in the islands differs widely from that on the mainland in the character of construction and cost per unit of water handled. On the mainland the greater part of the water is taken from perennial streams and carried in broad, shallow canals having a capacity of several hundred cubic feet per second. On the islands most of the water is taken from very small streams. The ditches head in high and exceedingly rough mountain regions, the ridges being so narrow and the slopes so steep that the water is conveyed largely in tunnels. The tendency is more and more to do away with open ditches, and practically honeycomb the catchment region with underground works.

"Storage reservoirs on the islands are small compared with those on the mainland. There are no large natural basins adapted to holding water. In most cases the underlying rock, consisting of lava, is very porous, and water is held only by the relatively thin layer of soil on top of the lava, in which there is usually little or no clay. On the island of Hawaii considerable difficulty has been experienced, as the soil of the basins there used as reservoirs has been penetrated by roots, which, decaying, form almost innumerable passages from the surface to the porous lava. Water may stand in such a reservoir at a depth of say 10 feet without serious loss, but when the height is increased to say 15 feet many holes will develop. Attempts have been made to pack the soil

by turning in cattle and sheep, in the hopes that the constant tramping will close all openings. Expensive tests have also been made of various ways of plowing the soil and subsoil and compacting this by heavy rollers or hammers. In each case, although temporary relief has been had, the increase of pressure on the reservoir has resulted in breaking through the earthy lining. The cost of completely stripping the reservoirs and of relining them is practically prohibitory.

"Pumping water for irrigation has been developed on the islands to an extent far in excess of anything in the United States, over 60 per cent. of the water used on plantations being pumped. On the mainland a height of 30 or 40 feet is considered for most crops the limit, but in the islands with higher crop values pumping to 10 times this height is not unusual. Much valuable experience has been obtained as a result of experiments made on a large scale with various forms of pumping apparatus. The direct-acting, slow-moving pump has been gradually done away with, and most of the new pumps are of the relatively high speed, fly-wheel type, with triple expansion cylinders and piston velocity up to 500 feet per second. These elevate water to a height of a little under 200 feet up to a maximum of 550 feet, at a cost of approximately $7.85 per million gallons (or $2.50 per acre-foot) for 100-foot lift. For different heights the costs are given as follows per million gallons:

Cost of Pumping, per Million Gallons.

100-foot lift	$ 7.85
200-foot lift	11.57
250-foot lift	13.44
300-foot lift	15.30
350-foot lift	17.17

"There are reported to be 111 pumps in operation, with a capacity of 580 million gallons for twenty-four hours, or 900 second-feet, supplying about 60,000 acres of land, about a million gallons to 100 acres or 1 second-foot to 64 acres. One acre requires about 5 million gallons or 15 acre-feet to produce a crop.

"RECLAIMABLE LANDS.

"The impression derived from a general examination of lands and waters on the islands leads to the belief that there are excellent opportunities for reclamation of public and private lands suitable for homestead purposes. The sugar companies have, as a rule, already irrigated most of the lands suitable for the production of cane, but there are considerable tracts of other lands not as well adapted to sugar cane which will have a great value when water is brought to them and they are intelligently cultivated. It is not practicable nor would it be desirable to attempt to point

out at this time any particular localities, but sufficient has been seen to justify a thorough survey and examination such as would result from the making of a topographic map, the measurement of streams, and the combining of the facts thus obtained with necessary engineering data.

"It is probable that over 100,000 acres of land now practically useless or furnishing only indifferent grazing can be reclaimed. Any estimates at the present time must be mere guesses, as there are no general data on the water supply available or the opportunities for storing floods. On this basis, however, it would be possible to furnish 5,000 farms having an average size of 20 acres each. This would be ample for most purposes, although in some instances the area of the farm should be larger, in others smaller. In laying out these farm units, they would probably include, besides an average of 20 acres of irrigated land, an additional area not irrigated, but suitable for other agricultural purposes, such as pasture and places for buildings.

"On this basis there would be added to the population of the Territory at least 20,000 persons, including 5,000 land-owning voters.

"Before any comprehensive system of reclamation can be wisely undertaken, either under territorial or federal auspices, it will be necessary to bring together all available data, and with these as a basis to take up systematically the collection of knowledge of the surface elevations and of the water supply; in other words, it is essential to have a good contoured topographic map of the islands such as that being made by the United States Geological Survey throughout the arid regions. Such a map, showing all elevations of the surface, the location of streams, and the position of the forested areas, gives at a glance the outline of the catchment of the streams, the position and size of natural reservoir sites, and other facts needed in a general cognizance and broad understanding of the relative position of the mountains, the streams, and the irrigable lands. There are, of course, other engineering data which must be studied and obtained by subsequent field examination, but the topographic map is the basis on which general plans must rest.

"Coördinate with the making of a good contour map should be carried on the systematic examination of the water resources. Much valuable information has already been brought together by individuals and corporations in connection with the proposed development of specific areas. Much of this material can doubtless be had by official inquiry, but it must be supplemented by further and more general investigation. It should be rounded out by studies relating to all of the streams, as well as those now known to be needed for particular tracts of land.

"Work of this kind has been conducted systematically since 1888 by the water-resources branch of the United States Geological Survey under general authority of law to investigate the ex-

tent to which the arid regions can be reclaimed and under specific appropriations for such work. The same system should be extended on this territory of the United States.

"Through the information thus given by a contour map and by data on stream flow, it will be possible to make broad and comprehensive plans for development of waters by tunnels, by storage reservoirs, by pumping, or other means. These plans, not confined to any particular tract of land, will necessarily be somewhat ideal in character, but once having the ideal system fully in mind it will then be practicable to fit this system in part at least to existing conditions of vested rights in lands or waters. Experience on the mainland has shown that, having a broad, comprehensive project, it has been possible to adjust the various difficulties or complications of vested rights and to secure a favorable outcome without recourse to condemnation or any form or force other than the pressure of enlightened public opinion.

"With the knowledge at hand it is apparent that there are excess or flood waters and some reservoir sites not yet utilized, and various tracts of public and private land which can be reclaimed, but to determine whether these particular localities are the best there must be a broad survey or general 'taking account of stock'."

Detailed information is given as to available water power and its present development, the aggregate of the development being approximately 6,500 horse-power. The conservation and development of water at high levels for irrigating purposes will render many other plants both possible and expedient.

Speaking of forest preservation it is stated that there is probably no part of the United States where the relations between available waters and forest cover are more intimate and more delicate.

"The island forests have use as furnishing a wood supply and some commercial timber, but, speaking broadly, nine-tenths of the value of the forest resides in its protection of the water supply. The rapid diminution in area of the forest has led to corresponding decrease in available waters and to the abandonment of hundreds of acres formerly cultivated, but now barren of vegetation.

"The retreat of the forest has been due primarily to unregulated grazing. Cattle, sheep and goats tramping through the forest eating some of the underbrush produce a condition which, although hardly visible to the eye, is unfavorable to the best growth of the forest. With weakened vitality the trees quickly succumb to the attacks of insect pests or blights. These enemies exist at all times, but under a healthy and undisturbed condition of the forest their presence is not apparent.

"The very delicate relations which exist can hardly be appreciated unless by actual observation. A forest absolutely free from intrusion by cattle will usually have its floor covered with a heavy plant growth; the soil is marshy to a degree that it is almost im-

possible to traverse the area. Let a few cattle run in the forest, making paths and nipping the younger foliage, and that although the absence of the plants can hardly be detected, yet there is a rapid drying out of the ground. The stranger will see an apparently untouched forest, and yet he finds that the soil is not marshy, and that the trees have begun to assume an unhealthy appearance and pests abound.

"It results from the peculiar character of the forests that, as a rule, lumbering can not be carried on, nor the mature trees removed without destruction of the forest or injury as regards its capacity to protect the water supply. This is notably the case with the Ohia Lehua (*Metrosideras polymorpha* Gand), where the cutting of the larger trees lets in the sunlight and quickly results in destruction of the wooded area. This important tree is parasitic in origin, has no tap root, and depends for its life largely on protection afforded by smaller trees and shrubs. In the case of the Koa, the so-called Hawaiian mahogany (*Acacia Koa* Gray), the conditions are different, as the removal of the older trees is not so injurious, and if men and cattle are excluded and the Hilo grass (*Paspalum conjugatum* Berg) gains no foothold, the young Koa trees will rapidly increase and in ten or fifteen years a good start toward commercial timber can be had.

"There are a few forests so situated that their influence on the water supply may be neglected, and these can be safely lumbered without injurious effects, but taking the forests as a whole, it must be said that the development of the islands requires that they be permanently reserved, protected by fencing, and carefully supervised by qualified rangers. In this respect a beginning has been made, but it is apparent that larger expenditures are absolutely necessary to afford full protection to the forest growth, and consequently to the water supply upon which in turn depends the value and capability of the agricultural lands to support a dense population."

In considering the industries of the Islands Mr. Newell shows that over nine-tenths of the products of the Islands consist of raw or refined sugars. "The business is one which under present conditions requires not only large capital but also a very large amount of manual labor. Being carried on in competition with countries where such labor is very cheap, the wages paid must be correspondingly low. The islands have the benefit of the federal protective tariff on sugar and it is presumable that a continuation of the industry rests largely upon this somewhat artificial and possibly insecure basis. The production of sugar has increased rapidly from 282,807 tons in 1899 to 521,123 tons in 1908.

"Some of the plantations have made large profits and have declared dividends up to 2 per cent. per month. Others have never paid expenses and some have gone into bankruptcy. Sugar stocks have been the favorite form of speculation (not to say gambling) in the islands. The production of sugar in 1908—521,123 tons

valued at over $40,000,000—is equal to nearly one-fifth of the amount consumed in the United States.

"About one-half the area producing sugar cane is irrigated or, say, 105,000 out of 213,000 acres. This irrigated land was reclaimed from aridity by private enterprise at a cost of about $15,000,000 or about $140 per acre. In comparison with this it may be noted that the cost of reclamation in the mainland—say for sugar-beet culture—has been about $40 per acre.

"The sugar produced per acre ranges from less than 1 ton to 10 tons and averaged for 1908 in round numbers 4½ tons per acre. From irrigated land the average was 5¾ tons per acre and for nonirrigated land 3 tons per acre. Only about one-half of the sugar land produces each year. The value of the sugar is about $70 per ton, or from $280 to $420 per acre every other year. Over one-half the cost of the sugar is in labor, this being about 60 per cent., but the proportion is gradually decreasing as labor-saving machinery is introduced and laborers become more efficient.

"A large item of expense is that for fertilizers, over $2,000,000 per year being expended for this purpose. An average of $4.65 per ton of sugar, or $22.20 per acre of crop.

"It requires from 18 to 30 months to mature a crop of sugar cane, so that the number of acres cultivated for each crop does not represent the total area in use. For example, the crop of 1906 came from 96,000 acres out of a little less than 200,000 acres, part of which was lying fallow and part in young cane."

Information and statistics of the rice, pineapple and fibre industries are given and mention made of the possibilities of other industries, such as cotton and tobacco.

LABOR.

Coming to the question of labor and its appurtenant questions Mr. Newell states:

"For a half century the question of labor has been and still is a most perplexing problem. The production of sugar, the main business of the islands, is under present conditions dependent upon cheap labor, mainly that of Orientals paid $17 or more in addition to house, water and medical attendance. There are approximately 95,000 of these aliens, over half of the entire population of the islands. Besides the Orientals there are 27,000 Portuguese, including with this Spaniards and others of Latin tongues. These men receive a slightly higher wage, $22 per month and upward, and demand perhaps better consideration than the Orientals, as they are eligible for citizenship and are more effective as laborers.

"With the rigid enforcement of the Chinese-exclusion act, the stopping of emigration from Japan, and the prevention of contract labor from abroad, the supply of cheap laborers has been practically cut off. Attempts are being made to bring immigrants

from San Francisco or even from New York, securing them as they arrive from Europe. The difficulty of getting these people across to the islands without losing them to other employers is very serious.

"The labor market is now practically surrounded by an almost impassable barrier; the number of laborers who are willing to work in the fields at low wages is decreasing, while the demand is steadily increasing. The planters, it is understood, have a fixed scale and theoretically at least do not compete among themselves, although by various methods of contract or bonus for length of service, there is a tendency to increase indirectly the wages paid. It is generally recognized that higher and higher grades of laborers must be secured as the Orientals decrease through return home or through entering into other industries.

"Systematic efforts have been made to improve the condition of the migratory laborers and to induce them to remain in a given locality. The Japanese are readily moved and are quick to resent any grievance. By impulsively shifting from place to place their effectiveness is far less than though they stayed on any one plantation where they could become familiar with conditions and the requirements of the manager. Their capacity to work effectively without constant oversight and their initiation is reported to be somewhat lower than that of the Portuguese.

"In the case of the Portuguese and similar laborers not only is the wage scale somewhat higher than that paid the Orientals, corresponding to their greater efficiency, but inducements have been made in the way of offering to them houses and small tracts of land on condition that they will live on the ground for two or more years and will make moderate payments in monthly installments. The offers of this kind have frequently been regarded with suspicion, but in a few cases they have been accepted. The average laborer would rather have a dollar or two more a month in cash than twice its equivalent in real property, as he is fearful of being tied down or he suspects some ulterior motive.

"In some localities the offers of free land from the Government have been accepted and small bodies of laborers are acquiring title. On one of the plantations railroad facilities have been provided by which the laborers located in their homes can reach other points of work if they so desire. Where the laborer finds he is thus free to seek other occupation he usually prefers to stay near home, work on the adjacent plantation, and with the help of his family cultivate his own little garden. Liberal treatment in such directions has been followed by more effective work and by less desire to move about from plantation to plantation.

"On the Olaa plantation in Hawaii an acre of ground is given to men who have worked for three years at regular wages. Over 50 Portuguese and 30 Spanish have availed themselves of this opportunity. With decrease in supply of labor from the outside the efficiency of the individual workers now employed is

steadily increasing, due to the more settled condition and to various other causes, so that now it is believed that the individual Japanese worker, for example, accomplishes 20 per cent. more than he did when he first came to the islands. This is due in part to the fact that many of the Japanese are taking small contracts for cultivating or cutting the cane; with aroused personal interest they are doing more and better work; also it is asserted that during the war with Russia the Japanese laborers were more or less excited and devoted considerable time to war news. After the cessation of the war and with the stimulus of rumors of possible troubles with the United States, the laborers resumed work with renewed vigor with the idea of accumulating as much money as possible in view of early return to their own country.

"With the increase of effectiveness of labor through better work on the part of the Orientals and higher grade of labor for the Latins, there is coming about also a reduction in the amount of heavy manual work. For example, the planters' experiment station has discovered that the stripping of cane, a very laborious process, does not add to its value, but even the reverse. With the elimination of the stripping, possibly 12 per cent. of the labor on the plantation will be reduced. The burning of the cane immediately before cutting tends to reduce the amount of material to be handled. Machinery is being introduced for loading cane as it is for unloading, and every possible effort is being made to utilize labor-saving devices, although it must be confessed that the progress in this direction has not been as marked as it has been in many others.

"The sentiment of the public as well as of the planters is rapidly crystallizing into well-defined movements to bring about not merely a better physical condition of the laborers, but also to bring to the islands only such men as are capable of becoming citizens.

"It can not be said that action along this line on the part of employers is wholly altruistic. It is due in part to the recognition of the fact that the public welfare demands that the greater part of the population shall be no longer alien; as voters the field laborers must ultimately yield a powerful influence. The evolution of the sugar industry seems to permit or even demand a higher grade of laborer. There is no doubt that the planters as a whole, actuated in part by patriotic motives, will gladly employ a higher type of men if they can be had.

"The factors working together for raising the standard of labor are national, territorial and individual: National in the exclusion of Orientals, territorial in the supervision of immigration and execution of public health and quarantine requirements, individual in the work being done singly by the planters or through their association, notably in experimental work.

"One of the first steps in advance is that of improving the laborers' quarters and of providing the more ambitious men with small

homes, where they can own the ground and become independent. The education of the children of the laborers is also resulting in appreciation of and demands for better housing conditions, but the effect of this education must be to keep a considerable part of the next generation out of the fields unless by that time labor-saving devices have been developed to a point where manual labor is more largely replaced by exercise of intelligence.

"The increase of product of sugar per individual employed in the field is illustrated by the fact that in 1904 about 8 tons of sugar were produced per man employed, and in 1908 there were 11 tons per man.

"IMPORTING LABOR.

"The labor question is by no means new now, nor is it wholly an outgrowth of annexation. From the very beginning of the sugar industry it was seen that the dependence could not be put upon native labor alone. The natives were not only decreasing in number, but were unwilling to work steadily in the fields. As early as 1850 the legislative assembly made provisions for contract labor. In that year the Royal Hawaiian Agricultural Society was founded with a view to promoting the interest of the planters. Under their auspices in 1852 Chinese to the number of 293 were brought in, followed by others annually, until in 1865 the board of immigration was created, and the Government entering more and more into the details of immigration finally became practically an employment agency, seeking labor in all parts of the world, notably from China, Polynesia, Japan, Portugal, Spain, Germany, Norway and Porto Rico.

"In all over 180,000 immigrants have been brought to the islands since 1852, at a total cost of over $9,000,000, or $50 each.

"The cost of bringing in the Japanese has been estimated at $70 per individual, of Chinese $75, and of Portuguese $115. Of the total imported, probably a half have gone home, others have died or left the fields and gone into varied industries, leaving about 45,000 laborers on the plantations.

"One of the latest and most successful attempts to bring in labor has been that of introducing Portuguese and Spanish. Three steamers brought in during 1907 an aggregate of 1,400 men, 1,143 women, 2,141 children, in all 4,684 individuals. This was done at an average cost, including the general superintendence of the work, of $62 per individual or a little over $200 for each adult male. The wages paid these men will average at first probably about $20 per month.

"As part of the systematic efforts of the territorial immigration commission, there have been brought back to the islands from San Francisco a considerable number of Portuguese laborers who left the islands to seek work on the mainland, hearing of the high prices paid in California after the earthquake. These people were

glad to return to the islands, but did not have sufficient funds. The Territory paid for their return passage at an average cost of $52 for each adult male, or $28 for each individual. There were thus returned 187 men, 63 women and 98 children.

"HOME MAKING.

"The supreme need of the islands from the standpoint of the national interest is that of increasing the number of citizens owning homes upon the lands. The relatively great proportion of laborers who are not citizens and the fact that there is such a small number of citizens who are land-owners and who have been brought up under democratic institutions, forms a source of weakness. Every possible effort should be made by public and private interests to put upon the land the best obtainable men, who will live upon small farms, cultivate the soil and become independent, self-supporting citizens. This need has long been recognized; many attempts have been made to remedy conditions, but most of these have not been successful, owing to a variety of reasons.

"The development of an agricultural citizen class—intermediate between the corporations owning large sugar plantations and the landless migratory laborer—is favored by natural conditions and by popular sentiment. The chief obstacles arise from the overshadowing interests of the great sugar industry and the resulting presence of Oriental or other low-grade labor, which tends continually to crowd out or take the place of the citizen engaged in individual enterprise. The Chinese in past years gradually replaced the small farmer and the local tradesman and mechanic. In turn he is being displaced by the Japanese, who, coming originally to labor on the plantation, sought easier work, took small contracts, started little stores to supply his countrymen, and now is getting into all agricultural lines excepting rice.

"It must be admitted that as matters now stand the newcomer finds difficulty in getting located. He is welcomed and treated with hospitality and if he is a laboring man or mechanic may find work, but the demand for such men is not large. If he is a farmer he will be more than welcome in sentiment, but from a business standpoint he will find it difficult to learn of a piece of land which can be secured on reasonable terms. It is probable that he will fall in with several of that numerous class of men who, not having succeeded themselves, spend their time in telling others of the disadvantages. This is a common condition throughout all countries which have reached a certain stage of development and where new men attempt to secure a foothold. In initiating a number of the reclamation projects on the mainland which have since proved successful, one of the first obstacles encountered lay in the old inhabitants, who seemed to make it a business to scoff at the efforts of the newcomers and to assure them that the conditions were such that they could not make a living. The

fact that they had failed was to them proof that no one else could succeed.

"The attitude of the present land-owners toward increase of settlement is favorable in theory. Each man concedes that it is for the public good to subdivide some of the larger holdings and to put these in the hands of the best class of citizens. It is, however, inseparable from human nature for Jones to think that Smith should subdivide his land first. There are always some special reasons why Jones thinks that his case is exceptional and he should not be called upon to make possible concession to the public good.

"There has been and possibly now is a fear among a few plantation managers that the small farmer will become a competitor in bidding for the services of the laborers brought to the plantation at great expense. There is some reason in this, but in the long run it is believed that the dangers imagined from this source will be more than outweighed by other benefits.

"The territorial government is attempting through the wise use of the public lands to promote settlement, and has from time to time modified the laws with this end in view. The practical difficulties are great, but, nevertheless, continued efforts are being made and every possible solution is being considered. The commissioner of the public lands, having the disposal of lands in direct charge, is studying from time to time the best method of subdividing each piece of government land as the lease expires, but, with limited assistance and the restrictions necessarily imposed, these results come slowly.

"The chief obstacles to more rapid subdivision of lands and settlement of the islands lie, first, in the prevailing ignorance concerning the country and its possibilities; second, in the present character of the land ownership; third, in the presence of a great body of Orientals; fourth, in transportation problems; and, fifth, in the absence of local or agricultural banks.

"First. Although the islands have been part of the United States for more than ten years, it is probable that relatively few persons on the mainland seeking new homes or larger opportunities are aware of the attractions afforded by the climate and fertile soil. This condition is being remedied by active efforts of the Territory and of various semi-official organizations, such as the promotion committee, which is circulating literature and calling attention to the opportunities.

"Second. The chief difficulty met by a prospective settler upon reaching the islands is to find any piece of land available for his use. It is true that the territorial government is subdividing lands and offering these from time to time, but most of the attractive places are immediately taken by men resident on the islands, some of whom may already have a home elsewhere. There is practically no private land for sale, but there is some offered for lease at what appear to be very high prices.

"Third. The presence of the Oriental laborer, forming the great mass of population, produces an artificial condition of social and business life not conducive to settlement by whites. In the arid States of the mainland where men take up land and make it valuable by their own labor, every man is on the same social plane with his neighbor and vies with him in physical as well as mental energies expended in daily labor. In the island, however, where practically all the physical labor is performed by Orientals, the tendency is for the white settler to endeavor to have his work done by Orientals. He tries to secure a larger piece of land than he could cultivate himself and to work it by cheap labor rather than take the small area and intelligently till it by his personal efforts. It is not that the climatic conditions are unfavorable to physical exertion, but largely because it is not customary for the white man to do work which can be performed by Japanese.

"Another unfavorable condition growing out of the presence of the Orientals is that they are willing to pay large rent for a piece of land instead of trying to own it, and are content with relatively small earnings. The white man can not compete with them in their own lines. His standard of living is so different that although he may possess superior intelligence he can not profitably utilize the ground to the same degree as his Oriental neighbor.

"Fourth. The problem of transportation is one which is ever present in a growing community. The present facilities of communication between the islands are in their way excellent and are constantly improving. There are also on some of the islands the beginnings of railroads more or less encircling them and bringing the products to convenient ports. There are only three of these, however, where steamers can lie at a dock, namely, at Honolulu, on Oahu, at Hilo, on Hawaii, and at Kahului, on Maui. At all other ports on the three islands named, and at all points on the other islands, the products must be lightered, usually in small boats, resulting in considerable expense and some uncertainty and danger in transfer.

"There are on most of the islands excellent wagon roads and others projected to reach the productive land. These roads, originally built by the provisional government and continued by the Territory, are now in the hands of county officials. Some are well maintained, on others the funds have not been effectively expended. The cost of transporting products, therefore, to the main lines of trade is frequently high, but with increase of production it is proper to expect that the facilities will be improved and the cost notably lowered.

"Fifth. There are practically no banks or institutions advancing money to farmers. The sugar industry is financed by a few large agencies who have little or no interest outside of this particular line. The fruit raiser or packer or the small farmer does not have the facilities of obtaining money possessed in most agricultural communities on the mainland. The Japanese have already

appreciated this fact, and by white assistance are starting a bank to help their fellow countrymen finance sugar-planting contracts and similar enterprises.

"HOME MAKING ON THE PUBLIC LANDS.

"The apparently obvious thing to do, and the action proposed by every person when he first considers the subject, is to cut up the public lands as soon as the leases run out and distribute the lands in small tracts to citizens. For example, the Territory owns 34,000 acres of rich land now leased to the plantations and cultivated in sugar cane. This land has a value of from $50 to $200 per acre, and would yield an annual rental of $8 or $10 per acre or even more. The question is frequently asked, Why not cut up this cane land into tracts of 40-acre homesteads? This seems to be a simple way of treating the problem. It has, however, been put to trial, without success. In general effect it has proved as advantageous to the public as it would have been to give to each applicant $2,000 to $8,000 in gold. The recipient of this gift would be greatly pleased, but the public treasury would be depleted by this amount.

"The giving away of this rich, highly cultivated land upon condition of residence upon it has resulted in the recipient making some indirect arrangement by which he virtually leases to the adjacent plantation the land which has been given him. Pending the time of securing complete title he establishes a nominal residence with the apparent intention of selling the land as soon as he can obtain title from the government. The home has usually consisted of the cheapest possible house or shack in which a human being can sleep occasionally and occupying the least possible amount of land, the remainder being devoted to sugar cane or other plantation purposes. The homesteader has not added to the value of the land in any respect, either by his personal labor or by intelligent supervision of the work of others. The conditions are similar to those on the mainland where homestead entries were received on valuable timber lands. Merely nominal residence was established, and when title was received the land was promptly sold to some large lumber company. As far as benefit to the commonwealth was concerned the government might better have sold the land directly and converted the proceeds to public uses.

"The experience had in these lines illustrates the fact that lands which are most valuable for some established and highly profitable line of industry will not be actually used as homesteads even if subdivided and given to applicants. No way has yet been devised for keeping a man on his homestead after he obtains title if he believes that he can make money more easily by selling his land to some corporation. To have a successful homestead, one which is a benefit in increasing the prosperity of any country, it is necessary to have, first, a man who really desires to own and cultivate a

piece of land, and who has the ability, physical and to a certain extent financial, so to do; second, the land open to homestead entry must be of such quality and so located that the entryman can raise food for home consumption and will prefer to live at home; and third, the surrounding conditions of market and transportation must be such that the products can be sold at prices profitable enough to support his family. If he can make as good or nearly as good a living by renting his land he will probably do so. Nothing can keep a homesteader on his land but the fact that this is, in his own opinion, the most suitable place to live, and when the earnings which he receives from cultivating the soil are higher than those obtained in any other way.

"One of the difficulties of bringing about actual homesteading is that inherent in distinguishing between the bona fide settler and the speculator. At present the territorial laws do not limit the number of homesteads that a man can take, with the result that having secured one homestead the owner can dispose of it and get another and another in succession without adding to the population of the country. A somewhat active sentiment on the part of the majority of citizens is to the effect that the preference should be given to natives. The idea prominent in public discussions when homesteads are mentioned is that the public lands should be divided up among the present population.

"There is no question but that each native should have a home and sufficient area for the support of his family, but it is not adding to the strength of the commonwealth to divide land among men who will not live upon it and improve it. The policy recently adopted of leasing, for a term of 999 years, small areas to the natives has proved most beneficial, both to them and to the public. In this way a man and his family may have sufficient land for their support if they use industry, and this land will remain in the family as long as it is used as a home. This policy appears to put a stop to much of the speculation which has prevented effective homesteading in the past.

"The disposal of the public lands in a limited number of small tracts from time to time as leases expire has prevented any general advertising of the fact that public land is available and thus has not attracted the attention of possible settlers from the mainland. It appears probable that if any considerable number of farm units could be disposed of by lot, it would be possible to attract the attention of desirable settlers and bring into the islands the class of men urgently needed.

"IS HOME-MAKING PRACTICABLE?

"Is it practicable in face of existing conditions of land ownership, of character of population, and of labor to greatly increase the number of small independent farmers, men who can and will maintain a relatively high standard of living? Can the pioneer

white farmer get a foothold on the islands where good agricultural land now rents each year at prices from $5 to $50 per acre? Will he bring his family to a community composed largely of Asiatics or the poorer grades of Latin races? Will he be content to labor in his field when most men of his race now act as overseers or employers and where coolies or peasants are hired for all manual work? Will he, on gaining full title to his homestead sell or lease to an Oriental, or be gradually crowded out, as has been the white mechanic and shopkeeper? It is evident that unless he can obtain a foothold and will be able to maintain the standard of living and the social and civic ideals of the Republic, there is little to be gained by attempts to merely increase population.

"There is little or nothing in the climate to prevent attaining in the islands as great or even greater success in small farming as that reached on the mainland. There are hotter parts of California and more enervating conditions in various parts of the newly settled West. There are similar difficulties in lack of transportation or in physical obstacles to be overcome. The problem is not so much one of natural environment but of artificial or civic conditions. As a consequence the remedy to be applied or the impediments to be removed are mainly artificial or social. The bringing about of the desired condition of a larger population and a greater percentage of intelligent voters must come in a different way from that on the mainland. There a high development was reached by the single-handed combat of each pioneer with his natural environment. On the islands, as above stated, the chief obstacles are of human or social origin, and a broad, intelligent coöperation must be had of all civic organizations combining toward the common end. In this should be united the agencies of the nation, the guardian of the Territory, as well as those of the Territory itself and the commercial or semi-public organizations of the people on the islands.

"Progress can not be made toward securing a larger settlement by breaking down any of the existing industries or taking away lands now devoted to high grades of agriculture. What is needed is to supplement and add to the present industries rather than interfere with them, or, putting the matter in more concrete form, it is not for the best public policy to try to cut down the area in sugar for the purpose of raising some other less valuable crop. Some well-intentioned persons have argued that in order to increase the desirable population of the islands the sugar plantations must be restricted and the lands now in sugar cane divided up. It is believed that this is neither practicable nor desirable. The sugar industry is the main support of the islands and will probably so remain until conditions have radically changed throughout the entire country. On the other hand, there are known to be large tracts of land which are not being put to their best use, largely because of lack of sufficient moisture. These are held, generally, by estates or by the government, and in some respect

the problem of their use is similar to that which has been successfully met by reclamation under the Federal Government. The underlying principles there have not been to deprive any industry of needed land but to take the lands which otherwise would be waste and desolate, bring water to them, and make it possible for men with skill and energy to put the lands in such condition that they become valuable and are capable of supporting the families of their owners."

STATISTICS OF IMMIGRATION AND EMIGRATION.

[From Report of Secretary of Commerce and Labor.]

During a portion of the past fiscal year, and extending into the present, this country has suffered an industrial depression due to a number of causes, among others the overproduction, which were world-wide, but perhaps for the time being more accentuated in this than in the other commercial countries.

The effect upon immigration to this country and emigration therefrom was almost immediate. While the immigration to this country for ten years and more had in each year increased considerably over the preceding year, the fiscal year 1908, as compared with the fiscal year 1907, shows a falling off of about 39 per cent., and as compared with the fiscal years 1906 and 1905 there were approximate decreases of 20 and 24 per cent. respectively. The total number of immigrant aliens who entered the country in the last fiscal year was 782,870, being 502,479 less than in the fiscal year 1907.

For the past fiscal year for the first time it has been possible, by virtue of the provisions of section 12 of the immigration act of February 20, 1907, to ascertain definitely the number of alien departures, and accordingly the net increase to our population by immigration. The new statistical table given in the report of the Commissioner-General of Immigration shows that in addition to 782,870 immigant aliens admitted to this country there were admitted 141,825 classed as non-immigrants, making a total of 924,695; and also that there departed from the United States 395,073 emigrant aliens, together with 319,755 non-emigrant aliens, making a total of 714,828. Deducting these total departures of aliens from the total arrivals during the fiscal year, the net increase of alien population has been 209,867. Even this net increase is further reduced by the departure from the United States of naturalized American citizens, concerning which latter class no method is provided by law for collecting data. While the number perhaps is not large, it is still appreciable.

It is worthy of note that of the 782,870 aliens admitted, 630,671 were between the ages of 14 and 44, and 112,148 were under the age of 14; only 40.051 had reached or passed the age of 45.

Of those admitted, exclusive of aliens under 14 years of age, 172,293 could neither read nor write, and 2,310 could read but not write. About 26 per cent. of those admitted, 14 years of age and over, were illiterate, as compared with 30 per cent. for the year 1907. The total amount of money actually shown to immigration officers by arriving aliens was $17,794,226, an average of almost $23 per capita. But it is well known that the amount actually brought over was considerably larger, as under the law aliens are not asked the amount of money in their possession in excess of $50, and there is a natural fear and timidity on the part of most aliens to exhibit a larger amount of money than is regarded by them as necessary for the purpose of reaching their destinations or to show that they have sufficient, in connection with their ability to work, to prevent them from becoming public charges. I have known instances, when I have been present at Ellis Island, when, upon questioning the immigrant, who had shown a nominal sum, as to whether that was all the money he had brought, he exhibited amounts five to ten times greater than he had originally shown.

STATISTICS OF NET IMMIGRATION.

The immigration figures published by the Department in past years, while as nearly correct as possible, either have not been fully understood by the general public or their real significance has misled it. After all, the main consideration is, not how many immigrants come to this country, but rather how many remain, and to what extent the population is augmented from year to year by this alien migration.

Based upon the alien departures for those months of the past year which preceded and were not affected by the industrial depression, the statistical expert of the Bureau has made a calculation of the net immigration for each year from 1899 to 1908, inclusive, giving the total alien arrivals, the total alien departures (in part estimated), and the ratio that the net immigration bears to the immigration figures heretofore published during that period. The statement shows that the net immigration for the period is only 68 per cent. of the accepted figures of immigration as heretofore published; in other words, the accepted figures of immigration are 48 per cent. in excess of the net immigration.

EMIGRATION.

The facility and cheapness of communication, especially in ocean travel, during the last two decades, which has contributed so materially to immigration to this country, has, as the figures I have referred to indicate, likewise contributed to emigration from this country to other lands. It has influenced also, in a much lesser degree, the migration from this country of native-born citizens.

There are some who regard this large emigration of aliens and naturalized citizens as an additional objection to immigration in

general, inasmuch as many of this class who come to this country, and by industry and economy accumulate what will give them, in the country of their origin, a reasonable competency, return thereto, either for temporarv sojourn or to spend their remaining years.

This subject has other important aspects which should not be lost sight of. Notwithstanding the large increase in immigration during the past decade, the wage standard of this country has not been lessened; on the contrary, it has continued to increase. The immigrants have also in more recent years contributed quite materially toward transplanting new industries from the different countries from which they emigrated, and toward expanding, among other industries, those that had already been transplanted and established. I think it can also be stated as a fact that the immigrant laborer as a class usually finds employment at the bottom of the scale of industries, thereby leaving the higher grades, where work is more remunerative, to the native workman.

In a commercial sense, this emigration is not without significance. The immigrant who comes to this country, lives here for a number of years, and returns either to his own country or to some other naturally takes with him, not only the money that he has, through thrift and industry, accumulated, but also, to a greater or less extent, American ideals, American tastes, and American requirements. These he consciously or unconsciously transplants. The influence of this emigration upon our foreign trade, especially upon our exports, is not inappreciable. The emigrant is a commercial missionary. His desire for many of our manufactures, with the need of which he has become accustomed, has doubtless, to some extent, contributed to the export of such products, both directly and indirectly to the country to which he has emigrated.

There is still a larger view which may properly be taken, and should not be disregarded. This migration, when normal and not induced by oppression or persecution, has a far-reaching influence in interpreting one nation to another, in establishing closer relations, and in promoting the peace of the world. Charles Sumner, in his "Prophetic Voices Concerning America," no doubt had this phase of the subject in view, together with other causes, when he stated that "the national example will be more puissant than army and navy for the conquest of the world."

Sugar Plantations, Cane Growers and Sugar Mills.

ISLAND AND NAME.		MANAGER.	POSTOFFICE.
OAHU.			
Apokaa Sugar Co	*	G. F. Renton	Ewa
Ewa Plantation Co	*	G. F. Renton	Ewa
Waianae Co	***	Fred Meyer	Waianae
Waialua Agricultural Co	*	W. W. Goodale	Waialua
Kahuku Plantation Co	x*	Andrew Adams	Kahuku
Waimanalo Sugar Co	**	G. Chalmers	Waimanalo
Oahu Sugar Co	x	E. K. Bull	Waipahu
Honolulu Plantation Co	**	Geo. Ross	Aiea
Laie Plantation	x*	S. E. Wooley	Laie
MAUI.			
Olowalu Co	**	Geo. Gibb	Lahaina
Pioneer Mill Co	x	L. Barkhausen	Lahaina
Wailuku Sugar Co	**x	C. B. Wells	Wailuku
Hawaiian Commercial & Sugar Co.	x*	F. F. Baldwin	Puunene
Maui Agricultural Co	...	H. A. Baldwin	Paia
Kipahulu Sugar Co	x	A. Gross	Kipahulu
Kihei Plantation Co	x*	A. J. McLeod	Kihei
Kaeleku Plantation Co	...	John Chalmers	Kaeleku
HAWAII.			
Paauhau Sugar Plantation Co	**	James Gibb	Hamakua
Hamakua Mill Co	*x	A. Lidgate	Paauilo
Kukaiau Plantation	x	A. Horner	Kukaiau
Kukaiau Mill Co	*x	E. Madden	Paauilo
Ookala Sugar Co	**x	W. G. Walker	Ookala
Laupahoehoe Sugar Co	*x	C. McLennan	Papaaloa
Hakalau Plantation	**	J. M. Ross	Hakalau
Honomu Sugar Co	**x	Wm. Pullar	Honomu
Pepeekeo Sugar Co	**x	Jas. Webster	Pepeekeo
Onomea Sugar Co	**x	J. T. Moir	Hilo
Hilo Sugar Co	**	J. A. Scott	Hilo
Hawaii Mill Co	x	W. H. Campbell	Hilo
Waiakea Mill Co	*x	C. C. Kennedy	Hilo
Hawaiian Agricultural Co	**x	Wm. G. Ogg	Pahala
Hutchinson Sugar Plantation Co	**	Carl Wolters	Naalehu
Union Mill Co	*x	H. H. Renton	Kohala
Kohala Sugar Co	*	Geo. C. Watt	Kohala
Pacific Sugar Mill	x**	A. Ahrens	Kukuihaele
Honokaa Sugar Co	x**	K. S. Gjerdrum	Honokaa
Olaa Sugar Co	xx	J. Watt	Olaa
Puna Sugar Co	xx		Kapoho
Halawa Plantation	x*x	J. Atkins Wight	Kohala
Hawi Mill & Plantation	††	John Hind	Kohala
Puako Plantation	††	Jno. C. Searle	S. Kohala
NiuliiSugar Mill and Plantation	*x	Robt. Hall	Kohala
Puakea Plantation	...	H. R. Bryant	Kohala
Kona Sugar Co	...	.....	Kona
KAUAI.			
Kilauea Sugar Plantation Co	**	F. Scott	Kilauea
Gay & Robinson	x*x	Gay & Robinson	Makaweli
Makee Sugar Co	...	G. H. Fairchild	Kealia
Grove Farm Plantation	x	Ed. Broadbent	Lihue
Lihue Plantation Co	x	F. Weber	Lihue
Koloa Sugar Co	x	L. Weinzheimer	Koloa
McBryde Sugar Co	*x	W. Stodart	Eleele
Hawaiian Sugar Co	x*	B. D. Baldwin	Makaweli
Waimea Sugar Mill Co	*	J. Fassoth	Waimea
Kekaha Sugar Co	x	H. P. Faye	Kekaha

KEY.

	HONOLULU AGENTS	
*	Castle & Cooke	( )
**	W. G. Irwin & Co	(8)
***	J. M. Dowsett	(1)
x	H. Hackfeld & Co	(9)
*x	T. H. Davies & Co	(8)
**x	C. Brewer & Co	(6)
x*	Alexander & Baldwin	(6)
x**	F. A. Schaefer & Co	(2)
x*x	H. Waterhouse Trust Co	(2)
††	Hind, Rolph & Co	(2)
xx	Bishop & Co	(1)